

National Aeronautics and
Space Administration

Educational Program

Educators

Grades K through
Postdoctoral

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NASA Implementation Plan for Education 1999-2003



Educational Excellence

We involve the educational community in our endeavors

to inspire America's students, create learning

opportunities, and enlighten inquisitive minds

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Executive Summary

This Education Implementation Plan, one component of the NASA Strategic Management System, provides general guidance for the implementation and continual improvement of the NASA Education Program for fiscal years 1999–2003. Therefore, this plan is primarily directed to those officials who are charged with the functional responsibility of conceiving, directing, and implementing education activities within NASA.

Specifically, this document:

- Identifies three leadership strategies to improve and guide our efforts
- Outlines our education agenda for the next five years through seven improvement initiatives
- Delineates the operating principles integral to the conduct of all NASA education activities
- Defines the NASA Education Program and Evaluation Framework, the basis from which our agency-wide and center-based programs are organized, implemented, and evaluated
- Describes the roles and responsibilities of the various organizational entities that carry out the NASA Education Program



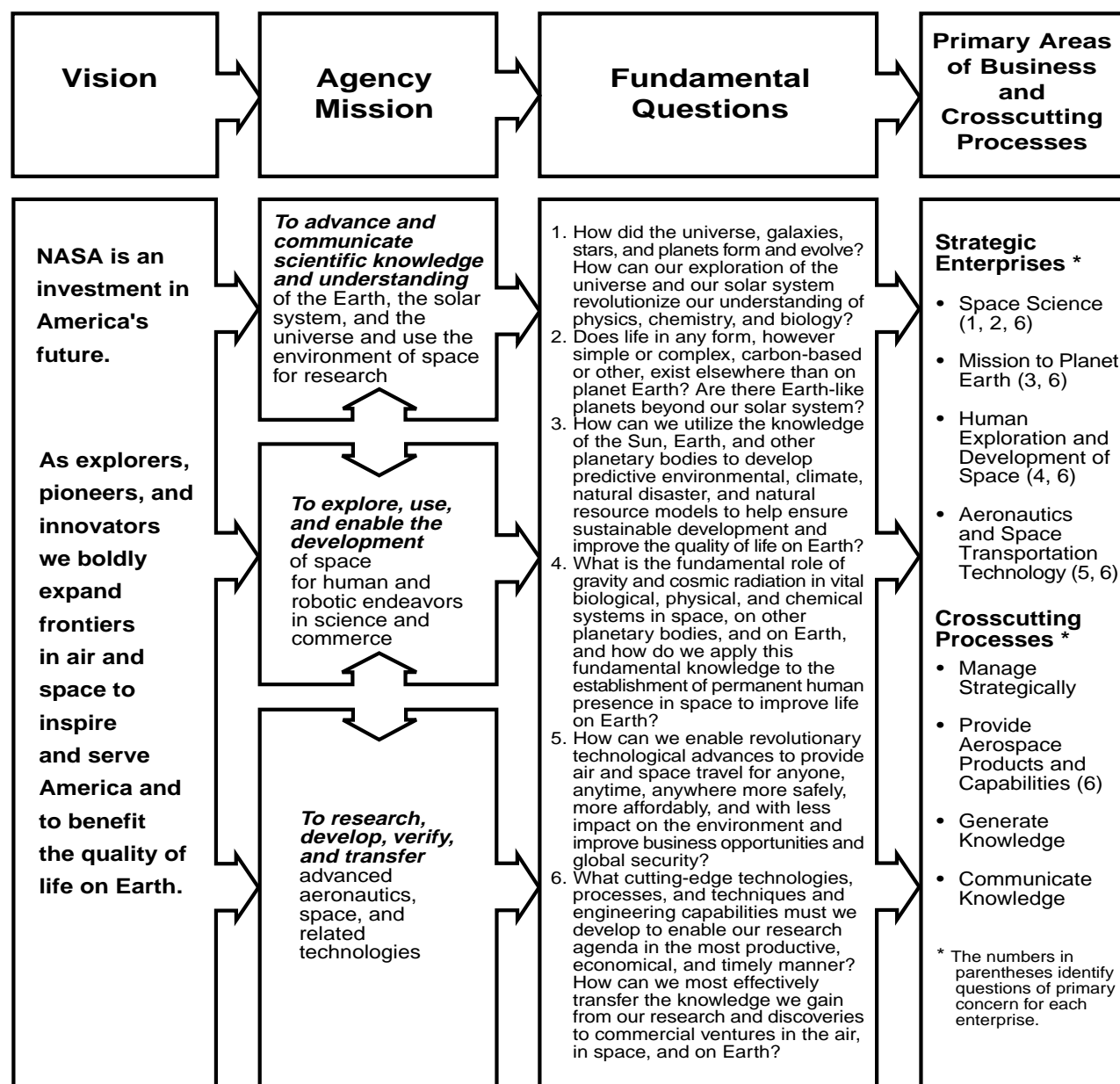


The Role of Education in NASA's Strategic Plan

Since the creation of the National Aeronautics and Space Administration (NASA), chartered by the Space Act of 1958, NASA has made a substantial commitment to education. That commitment has continued to the present and occupies a significant place in the NASA Strategic Plan (Figure 1). NASA's contribution to education has been and is based on the Agency's inspiring mission, special-

ized workforce, close working relationship with the research and development community, and unique world-class facilities. Based on these unique attributes, NASA has created a comprehensive Education Program containing a portfolio of activities directed toward education at all levels, undertaken by the NASA Office of Human Resources and Education, the Office of Equal Opportunity Programs, the NASA Enterprises, and the NASA Field Centers. The Office of Human Resources and Education has

Figure 1—NASA's Strategic Management System Roadmap



Agencywide responsibility for NASA's Education Program to establish policy, goals, objectives, and evaluation. The Office of Equal Opportunity Programs has responsibility for establishing policy, goals, objectives, and evaluation related to minority institutions of higher education. The NASA Strategic Plan cites Educational Excellence as one outcome of NASA's activities that contribute to the achievement of five of the Nation's science and technology goals and priorities.

Educational Excellence: We involve the educational community in our endeavors to inspire America's students, create learning opportunities, and enlighten inquisitive minds.

Using this outcome as guidance for NASA's Education Program, the NASA Education Program Mission Statement is as follows:

NASA uses its unique resources to support educational excellence for all.

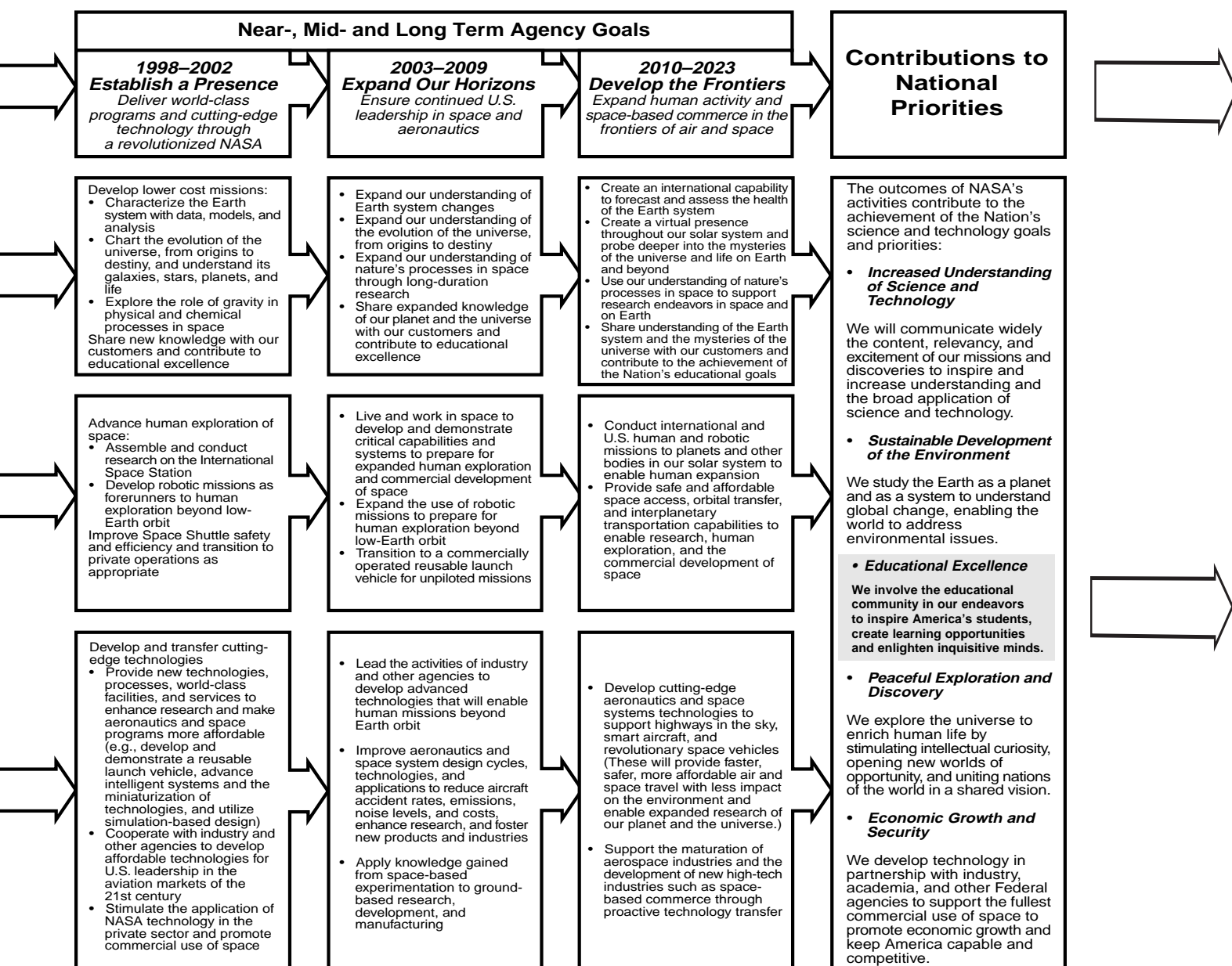
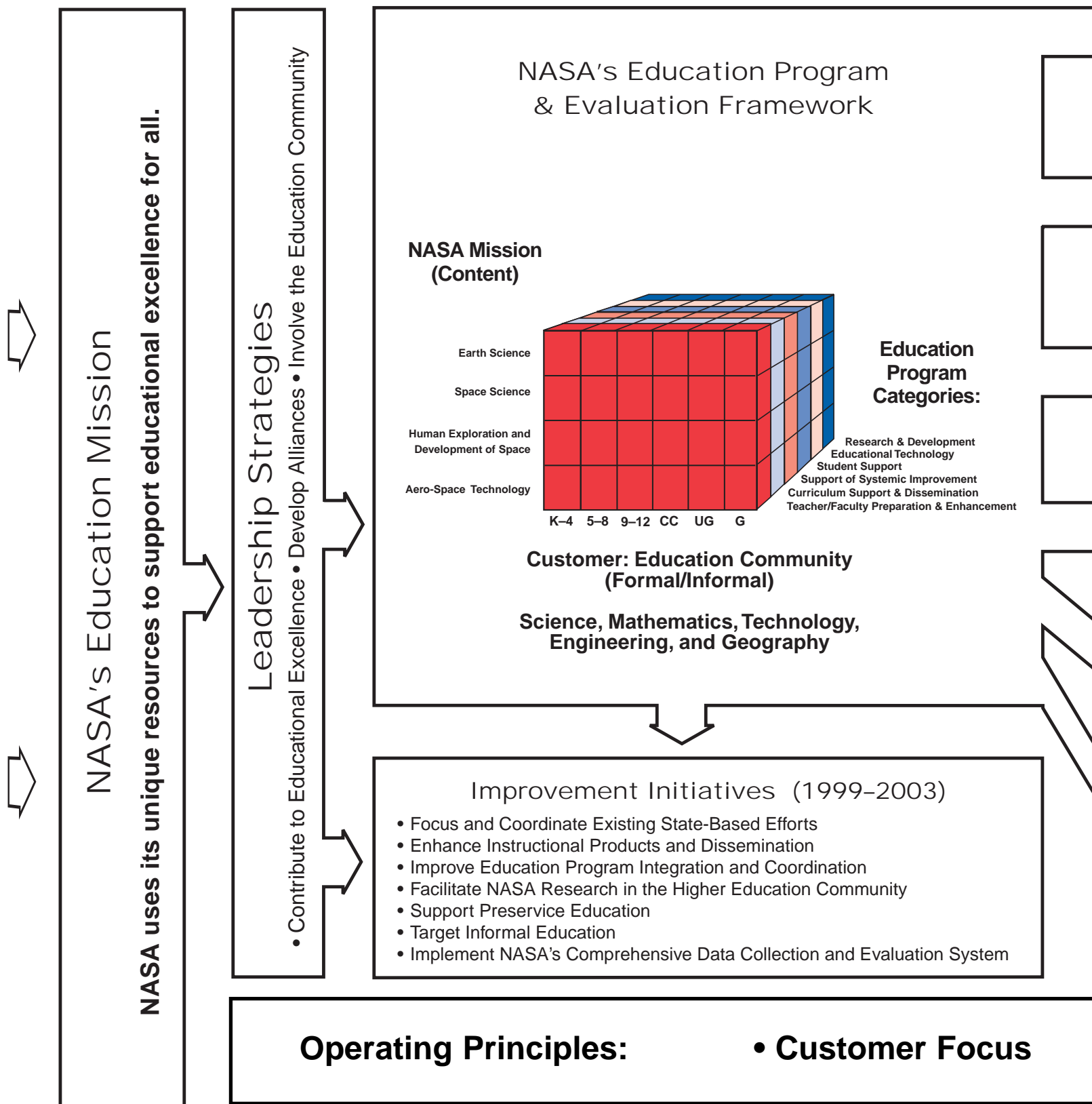


Figure 2—NASA's Implementation Plan for Education Roadmap



Education Program Categories: Goals/Actions

Teacher/Faculty Preparation and Enhancement

Goal:

To use the NASA mission, facilities, human resources, and programs to provide exposure to teachers and faculty, to support the enhancement of knowledge and skills, and to provide access to NASA information in science, mathematics, technology, engineering, and geography.

Teacher/Faculty Preparation and Enhancement

Actions:

1. Model inquiry-based science investigations
2. Expand follow-up with alumni
3. Expand scope to informal, urban, and rural efforts
4. Provide experience with educational technologies
5. Increase number of institutions involved in preservice education

Curriculum Support and Dissemination

Goal:

To develop, utilize, and disseminate science, mathematics, technology, engineering, and geography instructional materials based on NASA's unique mission and results, and to support the development of higher education curricula.

Curriculum Support and Dissemination

Actions:

1. Expand use in teacher training programs
2. Create a guide for developers
3. Replace outdated products
4. Improve the Educator Resource Center Network (ERCN)
5. Involve the ERCN with state systemic initiatives

Support of Systemic Improvement

Goal:

To use NASA's unique assets to support local, State, regional, and national science, mathematics, technology, engineering, and geography education change efforts through collaboration with internal and external stakeholders.

Support of Systemic Improvement

Actions:

1. Provide professional development in standards-led education
2. Review existing initiatives for alignment
3. Design or redesign programs to support systemic education
4. Expand interactions and cooperation with stakeholders
5. Develop and implement a plan to support state efforts

Student Support

Goal:

To support the NASA mission, facilities, human resources, and programs to provide informations, experiences, and research opportunities for students at all levels to support the enhancement of knowledge and skills in the areas of science, mathematics, technology, and geography.

Student Support

Actions:

1. Develop and maintain electronic information
2. Coordinate and articulate student programs
3. Develop and field test models to involve students

Educational Technology

Goal:

To research and develop products and services that facilitate the application of technology to enhance the educational process for formal and informal education and lifelong learning.

Educational Technology

Actions:

1. Produce teaching tools
2. Apply educational technologies in other programs
3. Use technology to facilitate communication
4. Use technology to involve educators in NASA missions
5. Research new teaching and learning practices

Research and Development

Goal:

To involve the education community, particularly higher education, in NASA programs that contribute to the development of new knowledge in support of the NASA mission, and to utilize the talent and resources of the higher education community.

Research and Development

Actions:

1. Develop a plan for research programs sponsored by the Education Division
2. Maintain an electronic data base of research opportunities
3. Disseminate results from research programs
4. Design and implement a pilot project for Space Grant Consortia to lead a Cooperative Extension-NASA interface in natural resource utilization

• **Collaboration**

• **Diversity**

• **Evaluation**



Leadership Strategies and Priorities: FY 1999–2003

Three leadership strategies have been identified to guide and improve NASA's Education Program. These strategies serve as broad, policy-level strategies that guide NASA's people, programs, and actions.

Contribute to Educational Excellence

In the execution of our activities, we strive to make a positive contribution to the goals established by the education community. In particular, our programs are based on national curriculum standards, State and local curriculum frameworks, and the research agenda of NASA and the higher education community. NASA's Education Program seeks to be judged by the external education community as a valuable asset. Our performance in carrying out activities and our success as a program will be judged on our ability to meet the educational community's requirements.

Develop Alliances

We will continue to strengthen existing alliances and develop new alliances with key external constituencies to define, expand, and leverage the impact of NASA's Education Program. NASA Field Centers are responsible for strengthening existing and establishing new alliances at the local, state, and regional levels, and NASA Headquarters is responsible for the national level. Our activities will be carried out to the maximum extent possible in collaboration with our partners.

Involve the Education Community

We seek to involve the education community in the NASA mission. We will actively engage students, teachers, faculty, schools, colleges, universities, professional associations, and national, state, and local education authorities in our projects and programs to enhance knowledge and to contribute to the NASA mission.

Outcomes: There are two broad outcomes of NASA's Education Program. These are as follows:

- **Excellence**—NASA seeks to be judged by its customer, the education community, as providing excellent and valuable educational programs and services. Therefore, we will attempt to maintain an "Excellence" rating ranging between 4.3 and 5.0 (on a 5.0 scale).
 - Quality rating by the educational customer of NASA's performance
 - Use standards/state curriculum frameworks to structure K–12 programs
 - Number of alliances
- **Involvement**—NASA strives to involve the educational community in our endeavors. Therefore, at the projected funding level for FY1999–2004, we seek to maintain a current level of participant involvement of approximately three million with the education community, including teachers, faculty, and students.
 - Total number of students/teachers/faculty involved in NASA education programs
 - Number of programs using NASA assets and types of assets used



Improvement Initiatives: NASA's Education Agenda

NASA's Education Program is broad and comprehensive. Seven specific improvement initiatives are identified to guide our programs, activities, human resources, and financial resources during the 1999–2003 fiscal years. These initiatives serve to guide our existing efforts as an Agency and serve as priority areas for new activities. It is a comprehensive list that will be carried out by the Agency as a whole through our Agencywide programs, the NASA Strategic Enterprise Offices, and programs executed at selected NASA Field Centers.

Focus and Coordinate State-Based Efforts

NASA's national Education Program is in one sense composed of 50 individual State programs. The reform of mathematics, science, technology, and geography in K–12 schools is inextricably linked to each State's higher education system and the States' agendas for economic development. Central to our State-based focus is the need for NASA to understand the State education agendas and place emphasis on coordinating our assets in a given State toward meeting that State's needs. By continuing existing and establishing new alliances, NASA seeks to connect NASA Principal Investigators, NASA-trained teachers, existing NASA education resources (for example, Educator Resource Centers and Space Grant Consortia), and commercial contractors with the State education leadership to determine how these assets may best be utilized within the State.

Major actions include:

1. Center Education Directors will establish relationships with their region's key State education stakeholders and seek to understand, develop, and coordinate NASA's educational efforts in each State.
2. Educator Resource Centers, Space Grant, EPSCoR, OSS Forums, OSS Broker/Facilitators, and other NASA education-funded directors will establish direct linkages with Center Education Directors and contribute to the coordination and delivery of NASA education efforts within a given State.

3. The Director of the Education Division will continue to develop linkages and support national organizations that assist NASA in achieving this state-based initiative. Such state-based organizations include the NSF/ED Systemic Initiative, the National Alliance of State Science and Mathematics Coalitions, the Aerospace States Association, the National Aerospace Education Alliance, the Space Grant Directors Council, the Association of State Supervisors of Mathematics, the Council of State Science Supervisors, and relevant education associations (NSTA, NCTM, ITEA, ASEE, USRA, and GENIP).

Enhance Instructional Products and Dissemination

NASA missions produce new data, images, and information that may be effectively included in textbooks, curricula, and supplementary instructional products. Working with professional education associations, State and local education authorities, universities, private enterprise, and other organizations, we will collaborate to develop instructional products consistent with the national curriculum standards and/or State or local curriculum frameworks. These products will be developed in multiple formats, with emphasis on innovative applications of educational technology and interactive strategies.

Major actions include:

1. Develop and distribute a handbook outlining NASA's protocol for the development, review, field testing, and distribution of instructional products.
2. Develop a set of K–12 instructional products, in cooperation with NSTA, ITEA, and GENIP, to support curriculum standards in science, technology, and geography. (NCTM completed in 1997.)

Improve Education Program Integration and Coordination

The NASA Education Program consists of many parts, which, when working together as a whole, can make a significant and positive contribution to the education community. The Implementation Plan is designed to ensure that the design, coordination, and implemen-



tation of NASA's numerous educational projects, programs, and activities achieve this vision of a single, unified Education Program. Because this vision will only be achieved if the Implementation plan is agreed to and followed, two terms are key:

- *Coordinate*—To work or act together harmoniously.
- *Integrate*—To form, coordinate, or blend into a functioning or unified whole..

The NASA education function exemplifies a higher degree of integration and coordination than has ever been experienced in the 40-year history of the Agency. However, work remains to improve the integration and coordination of our efforts. Improved program integration and coordination has to be accomplished at three distinct and interrelated levels: (a) Agency, (b) Center, and (c) Program/Project.

Major actions include:

1. **Agency Level**—Providing the Agency's focus, policy, and general direction for NASA's Education Program, it is incumbent upon the Headquarters staff of the Education Division, the Minority University Research and Education Division, and the Strategic Enterprise education functions to provide the leadership and strategies for a single, unified NASA Education Program. This Implementation Plan is the foundation for a single, unified Education Program.
2. **Center Level**—The Field Center education staff are responsible for implementing the NASA Education Program. It is incumbent upon the Center Education Director to establish and maintain organizational mechanism(s) to provide Centerwide integration and coordination of programs, projects, and activities. Additionally, the Center Education Directors and staff must identify linkages among Center programs, projects, and activities for NASA education customers.
3. **Program Level**—The managers of individual programs or projects must identify link-

ages to other programs and revise plans to ensure that these linkages are incorporated into each activity. These managers must also ensure that the program participants are made aware of related activities from which they may benefit.

Facilitate NASA Research in the Higher Education Community

Research relevant to NASA's four Strategic Enterprises is carried out primarily through NASA Strategic Enterprises, Field Centers, and the University community. However, some focused higher education programs are implemented by the Education Division and the Minority University Research and Education Division. Our goal is to streamline and focus these latter efforts so that they strongly support Agency research objectives as determined by the NASA Strategic Enterprises.

Major actions include:

1. Merge similar programs so that the best attributes of all are retained and enhanced.
2. Closely align research-related programs to the Strategic Enterprises' and the Field Centers' research agendas. Specifically, realign the EPSCoR program to meet NASA research needs and State research infrastructure priorities.
3. Collect, evaluate, and disseminate the most important research products (for example, publications, awards, and technology transfer products) so that these efforts are recognized by the Agency as relevant and important research contributions.

Support Preservice Education

Various national reports indicate that there will be a shortage of K-12 science, mathematics, and technology teachers over the next 5 years. Concomitantly, institutions responsible for training the next generation of teachers are aligning their preservice programs with new certification requirements and public policy expectations. While NASA's existing inservice programs need to continue at their present level, it is important for us to focus on new opportunities to support initiatives in the preservice

area. NASA's significant investments in research and development with institutions of higher education provide a unique asset to consider in identifying such opportunities.

Major actions include:

1. Continue to refine and support NASA's Project NOVA, a national preservice activity that seeks the collaboration of science, engineering, and education departments in preparing the next generation of teachers.
2. Implement a preservice Earth Science initiative through ARC, JPL, and campuses of the California State University system. This three-year initiative will model an approach that may be replicated in other regions and NASA content areas.
3. Encourage NASA-sponsored researchers at universities to collaborate with preservice education faculty to contribute to teacher preparation.

Target Informal Education

Museums, science and technology centers, and similar nonprofit education organizations support the formal education community and provide significant educational activities for learners of all ages. Most of these organizations are major community, regional, or national resources for science education. In addition, the informal education community has a tradition of presenting educational experiences using an inquiry, hands-on approach that is well aligned with the National Science Education Standards. We will work with and support these organizations.

Major actions include:

1. Define a NASA mechanism for working with the informal science education community.
2. Develop planetarium programs for national distribution.

3. In collaboration with the Strategic Enterprises, develop and implement an ongoing program to support the informal education community.
4. Continue to strengthen the National Aerospace Education Alliance.
5. Support National Science and Technology Week, Space Day, Space Week, and National Engineers Week.

Implement NASA's Comprehensive Data Collection and Evaluation System

In carrying out our aerospace mission, NASA strives to involve students and educators as both participants and partners. In conforming to the federal Government Performance and Results Act of 1993, NASA is committed to evaluating the performance of its programs and activities in order to report to the Congress and Administration and to provide for continual improvement of such involvement of the educational community in its missions, research, development, and achievements. To that end, the NASA Education Division is developing the NASA Education Evaluation System which includes an on-line, Internet based system for entry and collection of data from participants and program managers; follow-up studies; and briefing and statistical presentation materials to be used for analysis and reporting.

Major actions include:

1. Continue system implementation phase.
2. Continue to enhance the current features and options.
3. Strive toward a fully operational system which collects all Agency education data by FY 2000.
4. Continue to increase the Agency's use of the system for educationally related activities and programs where feasible.
5. Increase techniques and processes for conducting follow-up studies.





Operating Principles for NASA's Education Program

Four operating principles are integral to the conduct of NASA's Education Program. These principles apply to all of our programs, people, and activities. Adherence to these principles reflects the management philosophy of NASA's Education Program.

Customer Focus

NASA's mission-based Education Program is customer focused to serve the needs of the education community. NASA is committed to contributing to the achievement of the best education possible for all learners. We utilize the principles of standards-based, systemic education to guide the execution of our activities. We also strive to ensure that our program is implemented in a manner that is cost-effective, maximizes the value of the Agency's investment, and leverages NASA's fiscal and personnel resources.

Collaboration

We recognize that a wide variety of other educational organizations have much to offer us as we develop and implement NASA's Education Program. We seek to collaborate with all appropriate groups to help ensure our programs meet our customers' needs and are educationally sound. Collaborations are essential to meeting NASA goals.

Diversity

NASA strives to attract participants to our programs who are representative of America's diversity. We actively seek out qualified individuals and organizations from under-represented groups and encourage them to be involved in our activities. We strive to achieve and communicate a culture of trust, respect, teamwork, open communication, creativity, and empowerment. We also strive to achieve equity of access to information about our programs.

Evaluation

NASA's evaluation process determines the success of the NASA Education Program based on performance indicators that document the achievement of our improvement initiatives, goals, and objectives. This is accomplished by using both common and program-specific quantitative and qualitative indicators that assess relevant outputs, service, and program outcomes based on the accomplishment of the Agencywide goals and objectives for all NASA education activities. The method is an Agencywide, Internet-based data collection and reporting system designed for use in the field by the program managers and participants. Reports based on these data, including an annual evaluation report, will be used to improve program quality, increase cost effectiveness, and provide accurate reporting of program performance to Agency management, as well as to the Administration and Congress as required by law.

The NASA Education Program and Evaluation Framework

Background

The NASA Education Program and Evaluation Framework was established to serve as a model to guide the implementation and evaluation of NASA's Education Program. The framework was first proposed based on a study conducted by a panel of distinguished experts in education and evaluation. This panel was convened in 1994 by the National Research Council and produced the report, *NASA's Education Programs: Defining Goals, Assessing Outcomes*, which provided general guidance to NASA on establishing program goals and evaluation indicators.

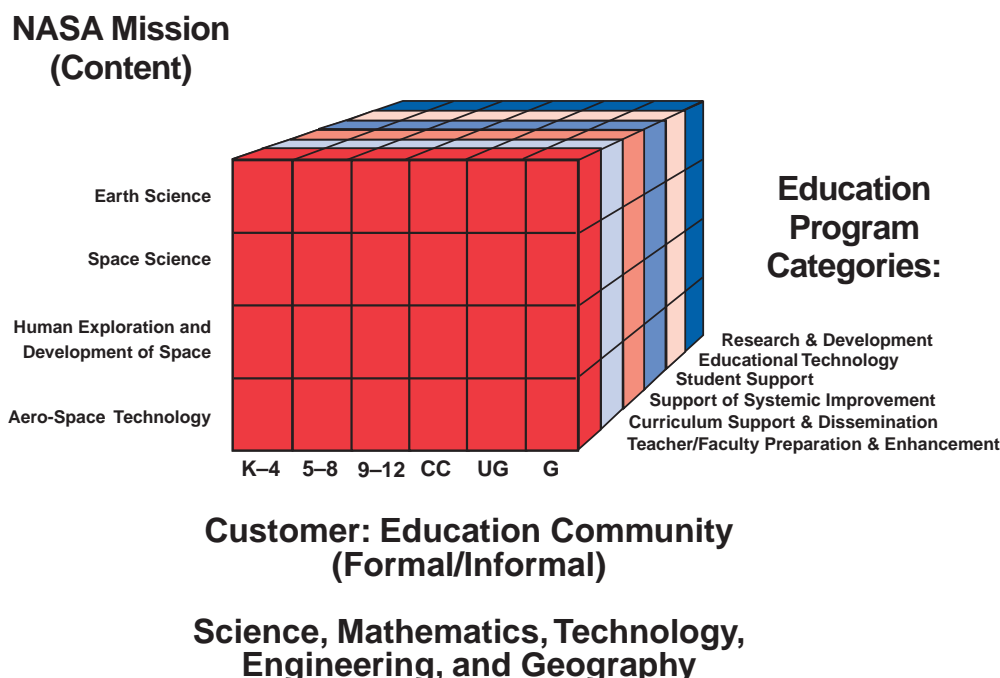
On November 30, 1994, the proposed framework was presented to NASA education personnel, including Center Education Directors, the Director of the Minority University

Research and Education Division, the Center University Affairs Officers, the Center Precollege Officers, and the Center Equal Employment Opportunity Officers at a meeting held at NASA's Johnson Space Center. This meeting resulted in Agencywide consensus on the framework and the establishment of goals for each implementation approach. From that time until now, the framework has been refined and updated, reflecting direction defined in the NASA Strategic Plan.

Description

The NASA Education Program and Evaluation Framework (Figure 3) provides a graphical representation of the NASA Education Program. It serves not only as a guidance tool, but also as an analytical mechanism to evaluate the comprehensiveness of our outreach to the education community. The framework depicts the integration of the three components of all NASA education programs, projects, or activities.

Figure 3—NASA's Education Program and Evaluation Framework





These three components are:

1. The content (based on the NASA mission)
2. The customer (the formal and informal education community)
3. The program category (the manner in which NASA education activities are provided to the customer)

The Content: The NASA Mission

The fundamental component of any NASA education activity is the content or knowledge derived from the NASA mission. At the Agency level, this knowledge is the outcome of the NASA mission as defined by the four Strategic Enterprises: Aero-Space Technology, Human Exploration and Development of Space, Earth Science, and Space Science. The knowledge derived from the NASA mission is the content and thus the foundation for all of NASA's education activities. The role of NASA's Education Program is to add value by translating this content to meet our customers' needs.

The Customer

NASA's education customer is the formal and informal education community. For the purpose of the framework, the formal education community is divided into the following levels based on grade: K-4, 5-8, 9-12, Community College, Undergraduate, Graduate, and Postdoctoral. At the K-12 levels, content (knowledge) derived from the NASA Strategic Enterprises is tailored to meet customer needs and is guided by curriculum standards for science, mathematics, technology, and geography at the national, State, and local levels. At the postsecondary levels, customers are directly involved in and support NASA's mission needs. The informal education community targets both the K-12 and postsecondary levels and includes science and technology centers, museums, planetariums, and other nonprofit education organizations.

The education customer is both the beginning and the ending point for all NASA education

activities. It is the customer's education agenda that serves as the starting point in defining an educational project or activity. Furthermore, the education customer evaluates NASA's education activities to determine whether the Agency is contributing to education excellence.

Program Categories

Six categories comprise the NASA education program and define the way in which the NASA content is delivered to the formal and informal education community. The following is a summary of these six program categories, including the goal, objectives, and specific actions for each one.

Teacher/Faculty Preparation and Enhancement

NASA uses its mission, facilities, human resources, and programs to involve educators and faculty to advance their knowledge and skills. We also provide access to NASA information in science, mathematics, technology, engineering, and geography. These programs are designed to provide professional development experiences for K-12 educators and higher education faculty that are involved in preservice education. Additionally, some programs are designed to provide research opportunities. The educators and faculty (a) participate in NASA research and development activities, (b) apply methods for integrating these resources into their teaching, and (c) are informed about available NASA resources.

Goal:

To use the NASA mission, facilities, human resources, and programs to provide exposure and experiences to educators and faculty, to support the enhancement of knowledge and skills, and to provide access to NASA information in science, mathematics, technology, engineering, and geography.

Objectives:

1. To provide NASA mission-based programs that introduce the application of science, mathematics, geography, engineering, and technology for use in student learning activities.



2. To provide educators with a wider range of alternatives using scientific inquiry, based on the NASA mission.
3. To encourage a “multiplier” effect to expand the benefits of the inservice program beyond participants to include additional educators.
4. To provide access to and promote utilization of NASA-related materials and information resources.
5. To increase the participation of underserved and under-utilized individuals and groups.
6. To facilitate collaborations between the faculty of teacher preparation departments and the faculty of scientific and technical departments to develop innovative approaches to teacher preparation.

Actions:

1. Model inquiry-based science investigations or meaningful mathematics problem solving by engaging educators in the kinds of learning they are expected to practice with their students.
2. Expand followup and networking opportunities for the alumni of NASA’s teacher enhancement programs through the use of electronic means, conferences, and training sessions.
3. Expand the scope of educator enhancement programs to include workshops at each Field Center for institutions in their region that serve the following communities: (a) informal education, (b) State-level urban systemic efforts, and (c) State-level rural systemic efforts.
4. Provide education experiences for educators in the effective application of educational technologies (such as

computers, telecommunications, videoconferencing, and CD-ROM) to present content and pedagogy.

5. Define and execute activities that target preservice education programs.

Curriculum Support and Dissemination

NASA develops, utilizes, and disseminates science, mathematics, technology, engineering, and geography instructional materials based on NASA’s unique mission and results and supports the development of higher education curricula. Because education is primarily a State and local issue, we seek to broadly understand common curricula topics or standards, collaborate with outside education experts, and work with NASA Strategic Enterprise content experts to translate the NASA mission into supplementary instructional products. These products are derived from the mission activities conducted by the four NASA Strategic Enterprises. A comprehensive dissemination system has been developed to ensure that our customers have access to these products. The system is composed of (a) a physical presence in each State providing access to and training in the use of NASA’s instructional products, (b) electronic networking resources, (c) integration of our instructional products into teacher/faculty workshops, and (d) partnerships with organizations involved in systemic education reform.

Goal:

To develop, utilize, and disseminate science, mathematics, technology, and geography instructional materials based on NASA’s unique mission and results, and to support the development of higher education curricula.

Objectives:

1. To develop science, mathematics, technology, and geography instructional materials that support curricula that are aligned with national standards and State frameworks and are based on NASA’s unique mission and results.



2. To facilitate the use of NASA instructional materials through educator training programs.
3. To disseminate NASA instructional materials to educators by fully utilizing NASA's distribution system for educators.
4. To review and revise existing NASA instructional materials to align with the national standards and State frameworks and update content based on NASA's unique mission and results.
5. To support activities that facilitate an exchange of information among higher education curriculum developers.

Actions:

1. Expand the use of NASA curriculum support products in educator training programs.
2. Improve the development process for educational products by creating and disseminating a handbook to provide guidance to individuals and organizations developing NASA curriculum support products.
3. Replace outdated NASA educational products with new versions that support the national education standards and State frameworks and that contain the most accurate and current content derived from NASA missions.
4. Improve communications among the Educator Resource Center (ERC) Network, NASA Field Centers, Headquarters, the OSS Forums and Broker/Facilitators, and other ERC's within the network, provide quality training on NASA content, and increase the use of NASA instructional products.
5. Through the NASA Field Center Education Offices, ensure that ERC's become part of

the systemic initiatives in each region and review ERC's to ensure their alignment with NASA's education objectives.

6. Where appropriate and feasible, ensure that all curriculum support products are available electronically.

Support for Systemic Improvement of Education

NASA uses its unique assets to support local, State, regional, and national science, mathematics, technology, engineering, and geography education efforts through collaboration with internal and external stakeholders. As the United States continues to reform science, mathematics, technology, and geography instruction in its K-12 schools, NASA has placed emphasis on coordinating all of the NASA assets in a given State toward assisting in meeting its goals for improvement of the state's system of education. By establishing a variety of partnerships, NASA seeks to convene NASA Principal Investigators, NASA-trained teachers, and commercial contractors with the State's education leadership to determine how these assets may best be utilized within the State.

Goal:

To use NASA's unique assets to support local, State, regional, and national science, mathematics, technology, engineering, and geography education change efforts through collaboration with internal and external stakeholders.

Objectives:

1. To coordinate planning among NASA education initiatives to ensure alignment with and support of standards-led systemic improvement initiatives of the states.
2. To redirect existing education programs, and to ensure that new initiatives address State needs and their unique education and economic development efforts.
3. To support standards-based science, mathematics, technology, and geography education change by aligning NASA educational



programs and products with the national/ State standards.

4. To expand interactions with external stakeholders in the systemic improvement of education change.

Actions:

1. Provide professional development and support on standards-based education initiatives to NASA's internal education community.
2. Review existing NASA education initiatives to ensure their alignment with the national vision and philosophy for standards-based systemic reform.
3. Design new programs or redesign existing programs to ensure that all NASA efforts align with the science, mathematics, technology, and geography education standards and support the needs of those engaged in the implementation of standards-based science, mathematics, technology, and geography education at the State and local levels.
4. Leverage the use of NASA programs and resources by expanding NASA interactions and cooperation with all stakeholders involved in national and State systemic initiatives.
5. Through the Field Centers develop and implement a plan that supports the needs of individual States.

Student Support

NASA uses its mission, facilities, human resources, and programs to provide information, experiences, and research opportunities for students to support the enhancement of knowledge and skills in the areas of science, mathematics, technology, and geography. Student support programs are intended to involve students in the intrinsically interesting and informative NASA mission.

Goal:

To use the NASA mission, facilities, human resources, and programs to provide information, experiences, and research opportunities for students at all levels to support the enhancement of knowledge and skills in the areas of science, mathematics, technology, and geography.

Objectives:

1. To provide NASA mission experiences and information that are designed to promote students' interest in science, mathematics, technology, and geography.
2. To provide exposure to NASA research and/or research experiences and activities to promote science, mathematics, technology, engineering, and geography career awareness.
3. To provide support to the science and technology workforce pipeline by including greater participation of individuals who are under-represented in science, mathematics, technology, and geography in NASA student programs.
4. To increase the number of NASA student support opportunities through partnerships and interagency cooperation and collaboration.

Actions:

1. Develop and maintain electronically disseminated communication of NASA-sponsored student opportunities and career information.
2. Coordinate NASA's student program efforts and ensure the progression of student programs.
3. Develop and field-test models for involvement strategies in all student programs.



Educational Technology

NASA researches and develops products and services that facilitate the application of technology to enhance the educational process for formal and informal education. NASA's Educational Technology program supports two of the four components of the National Educational Technology Initiative. NASA addresses the development of innovative learning tools and strategies, as well as teacher training.

Goal:

To research and develop products and services that facilitate the application of technology to enhance the educational process for formal and informal education and lifelong learning.

Objectives:

1. To produce technology-based teaching tools and strategies that are grounded in or derived from NASA mission.
2. To use emerging technologies for, and apply existing technologies to, educational programs.
3. To utilize technology to facilitate communication within the educational community.
4. To involve educators in NASA missions through innovative uses of technologies.
5. To conduct research into new teaching and learning practices that are made possible through NASA mission-derived technology.

Actions:

1. Provide technology training and support for the persons involved in the operation of the Educator Resource Center Network, the National Space Grant College and Fellowship Program, and other programs as necessary.

2. Implement a coordinated electronic dissemination system that ensures that all NASA education activities and products are available through appropriate networking technologies (that is, the Internet and satellite or cable television).
3. Demonstrate NASA's educational technology resources at professional development conferences and other relevant venues.
4. Develop innovative learning tools and technologies that are integrated with curriculum support and teacher enhancement activities.
5. Develop, implement, and evaluate distance education and virtual mentoring projects.
6. Support distribution of excess NASA equipment to schools and institutions of higher education under the authority of Executive Order 12999, "Education Technology: Ensuring Opportunity for All Children in the Next Century."

Research and Development

Research and development activities occur primarily, though not exclusively, at the graduate level and involve graduate students and faculty who make substantive contributions to NASA's mission, the four Strategic Enterprises, and the "Generate Knowledge" process. In addition to directly supporting NASA programs, these activities promote the development of new collaborations with the academic community and significantly enrich graduate education and research.

Goal:

To involve the education community, particularly higher education, in NASA programs that contribute to the development of new knowledge in support of the NASA mission, and to utilize the talent and resources of the higher education community.



Objectives:

1. To provide administrative infrastructure to support NASA-sponsored programs for the academic research community.
2. To communicate opportunities for NASA-sponsored research and changes in NASA research policy to the academic community.
3. To act as a liaison between the higher education community and the NASA Field Centers.
4. To establish and maintain communication among NASA-sponsored university programs, NASA Headquarters offices, and the Field Centers.
5. To promote sponsorships among the business and industrial community with NASA-sponsored research programs.
6. To encourage the transfer of NASA-funded technology development to the commercial sector and to the American taxpayer.

Actions:

1. Develop, in consultation with relevant stakeholders, an implementation plan for all NASA research programs sponsored by the Education Division.
2. Produce and maintain an electronically disseminated communication system of NASA-sponsored research opportunities, which provides a single point of information for individuals and organizations seeking to participate in NASA research activities.
3. Track, evaluate, and disseminate the results of research programs sponsored by the Education Division (for example GSRP, Space Grant, EPSCoR, and RRAP) through the NASA education evaluation system.
4. Increase the visibility of university programs, particularly within NASA, and the unique role these programs play in facilitating collaborations with the academic community.
5. In collaboration with the Earth Science Enterprise, design and implement a pilot project for Space Grant Consortia to lead a Cooperative Extension-NASA interface in natural resource utilization.



Roles and Responsibilities in the Implementation of NASA's Education Program

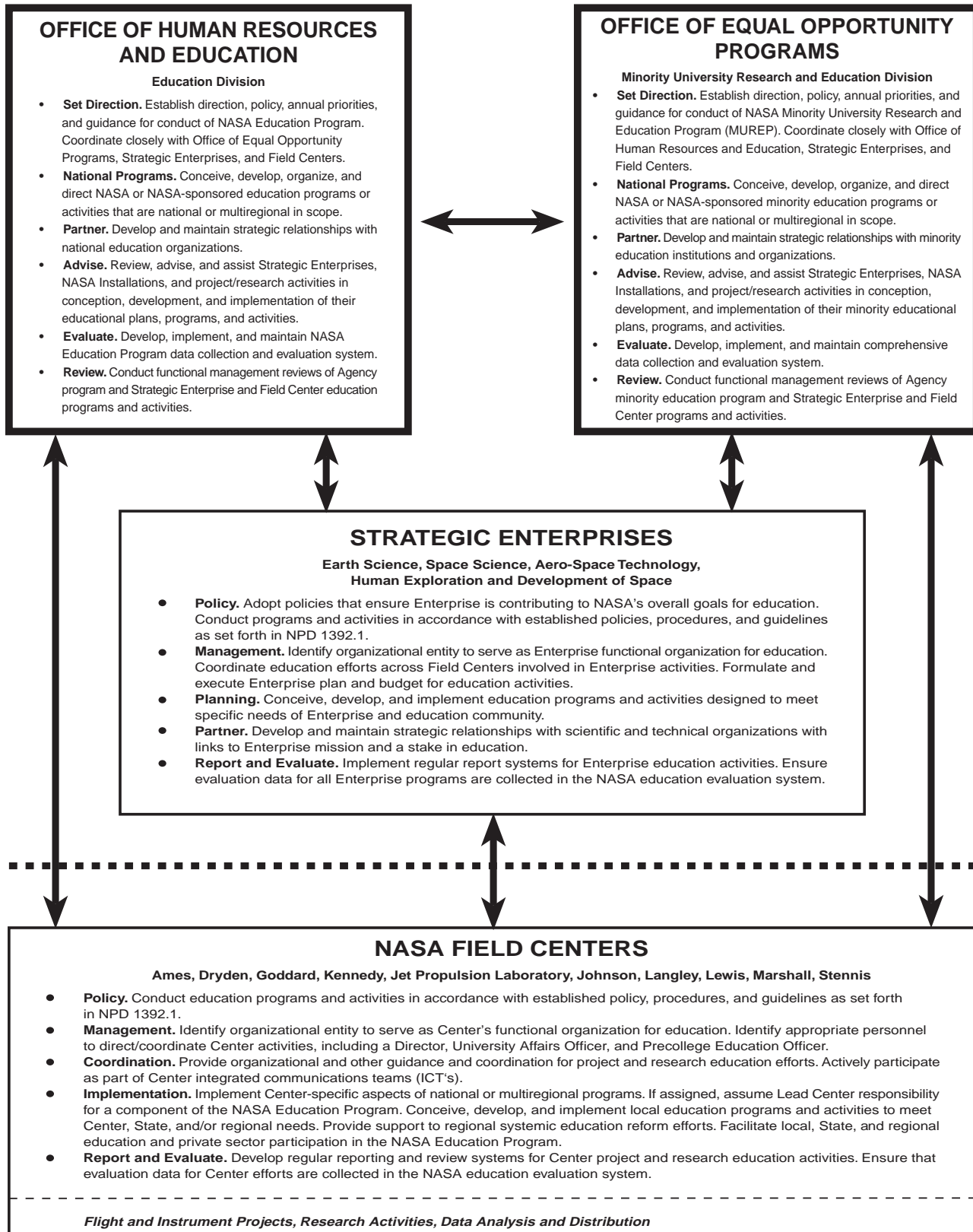
The Office of Human Resources and Education, Education Division, is responsible for Agency-wide direction, policy, and guidance for the NASA Education Program as outlined in NPD 1392.1C, "Conduct of the NASA Education Program" (Appendix C). Consistent with NPD 3515.2, the Office of Equal Opportunity Programs, Minority University Research and Education Division, is responsible for NASA's policy related to minority higher education insti-

tutions. The Offices of Human Resources and Education and Equal Opportunity Programs work closely together to execute these policies.

Each NASA Strategic Enterprise Associate Administrator and each NASA Field Center Director is responsible for designating a single individual to serve as the Enterprise or Center Education Director. The Directors ensure close coordination with the Office of Human Resources and Education, Education Division.

The specific roles and responsibilities of the major organizational elements responsible for education are depicted in Figure 4.

Figure 4—Roles and Responsibilities in NASA's Education Program





Appendix A

Definitions and Acronyms

ASEE: American Society for Engineering Education

CSSS: Council of State Science Supervisors

Education Community: The education community is composed of both people and organizations. People include students, teachers, faculty, university researchers, curriculum supervisors, and administrators. Organizations include local, regional, or State education authorities, colleges, universities, professional education associations, aerospace education organizations, museums, science and technology centers, and the aerospace industry. NASA's Education Program primarily supports the science, mathematics, technology, engineering, and geography curricula.

Education Program Evaluation System: A system consisting of a set of goals, objectives, and evaluation indicators for each of the six program categories and the constituent components of each. Also included in the system is a networked computer data base that allows for remote data entry, analysis, and reporting.

EPSCoR: Experimental Program to Stimulate Competitive Research

GENIP: Geographic Education National Implementation Project

GSRP: Graduate Student Research Program

HBCU: Historically Black College and University

HEDS: Human Exploration and Development of Space (Enterprise)

ITEA: International Technology Education Association

JPL: Jet Propulsion Laboratory

MOU: Memorandum of Understanding

NIEI: NASA Industry Education Initiative is an initiative formed through an MOU among NASA and approximately 30 major aerospace contractors. The MOU pledges that the partners will work together in support of NASA education priorities.

National Aerospace Education Alliance: An alliance of NASA, the Astronaut Memorial Foundation, the Challenger Center for Space Science Education, the U.S. Space & Rocket Center, the U.S. Space Foundation, the Young Astronaut Council, the Kansas Cosmosphere & Space Center, and the Manned Space Flight Education Foundation.

NCTM: National Council of Teachers of Mathematics

NSF: National Science Foundation

NSTA: National Science Teachers Association

OAT: Office of Aero-Space Technology (NASA Enterprise)

OES: Office of Earth Science (NASA Enterprise)

OMU: Other Minority University

OSS: Office of Space Science (NASA Enterprise)

Science Education: Education designed to help individuals specifically achieve understanding of how science works to facilitate understanding and knowledge acquisition about how the world works and to apply this knowledge to meet changing human needs.

Technology Education: Education designed to prepare individuals to apply technology to meet changing human needs. This is accomplished by providing individuals with firsthand experiences utilizing tools, machines, materials, and techniques to solve problems.

Appendix B

Resource Requirements

NASA's budget request for Education Programs in FY 1999, the first year of this Implementation Plan, is \$54.1 million. This amount, supplemented by additional financial resources from the Minority University Research and Education Program and from the Strategic Enterprises, provides the funding for the NASA Education Program.

Significant decreases in our budget will result in a reduction in the output of NASA's education program. NASA's program is predicated on the assumption that a viable education program must be comprehensive and address each of the areas represented in the NASA Education Program and Evaluation Framework. NASA's program must maintain a threshold level of activities in (a) each of the Strategic Enterprises, (b) all levels of the education community, and (c) each of the six program categories. Therefore, significant budget reductions would result in a lower level of effort in each of these areas rather than the termination of a component of the Framework.

The conduct of NASA's Education Program is a people-intensive operation. It is important to note that the primary limiting factor on the quality and quantity of NASA's Education Program is the available human resources. To maintain a viable program capable of achieving education excellence, we must have a critical mass of personnel with skills, experiences, and expertise in education. We are currently operating at full capacity. A significant budget increase or an increase in program requirements or expectations will require additional qualified personnel.





Appendix C

Authority for the Conduct of NASA's Education Program

The following documents may be found at the Education Homepage at
<http://www.hq.nasa.gov/education>

NPD 1392.1C - Conduct of the NASA Education Program
NMI 8320.1D - Basic Policy for NASA-University Relationships
Executive Order 12999 - Education Technology: Ensuring Opportunity for All Children in the Next Century
Executive Order 12876 - Historically Black Colleges and Universities
Executive Order 12900 - Educational Excellence for Hispanic Americans
Executive Order 13021 - Tribal Colleges and Universities
NPG 1090 - Requirements for Communicating NASA's Knowledge from Program Projects
NPD 1090 - NASA's Communicate Knowledge Process Policy for Programs and Projects

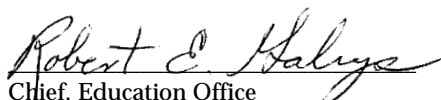
Appendix D

Education Management Council Concurrence


We, the Senior Managers of NASA with direct responsibility for the implementation of the NASA Education Program, are committed to working together, working with the men and women of the Agency, and working with our Stakeholders, to achieve the goal of Educational Excellence and to achieve the full implementation of this plan.



Director
Education Division
Office of Human Resources and Education



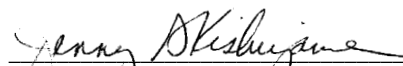
Chief, Education Office
Goddard Space Flight Center



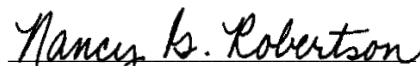
Director, Minority University
Research and Education Division



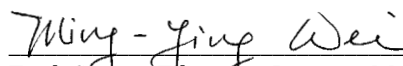
Director of Education
Jet Propulsion Laboratory



Alliance Development Manager
Office of Aero-Space Technology



Director of Education
Johnson Space Center



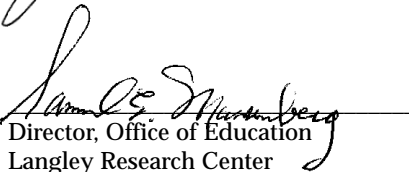
Earth Science Education Program Manager
Office of Earth Sciences



Deputy Director for Business Operations
Kennedy Space Center



Education Manager
Office of Life and Microgravity Sciences



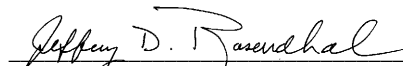
Director, Office of Education
Langley Research Center



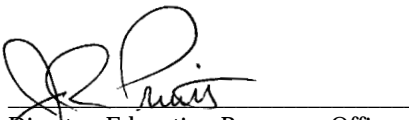
Chief, External Liaison Office
Office of Space Flight



Director of External Programs
Lewis Research Center



Education Manager
Office of Space Sciences



Director, Education Programs Office
Marshall Space Flight Center



Director of Education (Acting)
Ames Research Center



Chief, Education and University Affairs
Stennis Space Center



Director of Education
Dryden Flight Research Facility





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NASA values the comments and recommendations of our stakeholders, customers, partners, employees, and contractor community. For further information regarding the NASA Implementation Plan for Education 1999-2003, please contact:

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The NASA Implementation Plan for Education 1999-2003 is also available on the World Web Web at: <http://www.hq.nasa.gov/education>